RAWTAN LARUT RESAPAN MENGGUNAKAN PENJERAP MEDIA KOMPOSIT KARBON TERAKTIF, ZEOLIT, BATU KAPUR DAN ENAPCEMAR SISA KERTAS

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Tesis ini dikemukakan sebagai
memenuhi syarat penganugerahan
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PENGHARGAAN

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ABSTRAK

Kajian ini dijalankan bagi meneroka potensi WPS dan LS untuk menggantikan sebahagian AC dan ZEO dalam penghasilan media komposit baharu. Nisbah optimum AC-WPS (media hidrofobik) adalah 2:2, manakala ZEO-LS (media hidrofilik) adalah 25:15. Nisbah optimum 4:4 media hidrofobik-hidrofilik dipilih berdasarkan ciri-ciri penjerapan NH_3-N dan COD, dan 30 % OPC telah digunakan sebagai bahan pengikat. Media komposit ZELPA telah dihasilkan dan pencirian sifat fizikal-kimia dilakukan. ZELPA digunakan dalam kajian isoterma penjerapan NH_3-N, COD dan warna pada keadaan optimum pH 7, kelajuan goncangan 200 rpm, saiz partikel 1.18-2.36 mm dan masa sentuhan 120 minit. Setelah ujian kelompok dilaksanakan, ujikaji isoterma penjerapan dan kinetik penjerapan dilakukan. Kapasiti penjerapan untuk kesemua parameter (dalam mg/g) masing-masing 27.55, 48.08 dan 34.48. Kajian perbandingan menunjukkan keupayaan penjerapan ZELPA terhadap NH_3-N dan COD adalah lebih baik daripada ZEO dan AC, dan setanding dengan AC bagi penjerapan warna. Kajian kinetik penjerapan mendapati ZELPA mengikuti hampir kesemua model yang dikaji iaitu pseudo tertib pertama dan kedua, Elovich dan pembauran intra-partikel. Kajian penjerapan turus dengan menggunakan model EBCT menunjukkan penyingkiran sebanyak 99 % untuk NH_3-N dan 98 % untuk COD dan warna. Kapasiti bolos dan masa tepu didapati makin berkurangan dengan berlakunya peningkatan terhadap kadar aliran. Didapati data uji kaji lebih mematuhi Model Thomas dan Yoon-Nelson berbanding Adams-Bohart. ZELPA boleh digunakan semula selepas menjalani ujikaji regenerasi dengan larutan 0.5 M NaCl pada pH 11-12 (dilaras dengan 1 M NaOH). Dengan kapasiti penjerapan untuk NH_3-N, COD dan warna (dalam mg/L) masing-masing 32.26, 38.76 dan 31.95. Gabungan media alternatif WPS dan LS menunjukkan impak positif dalam penjerapan larut resapan. Penggunaan WPS dalam teknologi penjerapan secara tidak langsung berupaya menangani masalah pelupusan sisa kertas yang tidak boleh dikitar semula.

ABSTRACT

This study was conducted to explore the potential of WPS and LS to partially replace AC and ZEO in producing a new composite adsorbent. Optimum ratio of AC-WPS (hydrophobic media) was 2:2, while ZEO-LS (hydrophilic media) was 25:15. Optimum ratio 4:4 for hydrophobic-hydrophilic media were chosen according to adsorption behaviour of NH_3-N and COD, and 30 % of OPC was applied as a binder. Composite media ZELPA was produced and their physico-chemical characteristic were determined. ZELPA was used in isotherm study for NH_3-N, COD and colour at optimum pH 7, 200 rpm shaking speed, 1.18-2.36 mm particle size and 120 minutes contact time. After conducting batch experiment, the adsorption isotherm and kinetic experiment were performed, as comparison between those two experiments. The adsorption capacity (in mg/g) of aforementioned parameters are 27.55, 48.08 and 34.48, respectively. Comparative study shows the adsorption capacity of ZELPA towards NH_3-N and COD were improved than ZEO and AC, and on a par with AC for colour adsorption. Adsorption kinetic study found ZELPA was followed almost all kinetics models (i.e. pseudo-first and second order, Elovich and intra-particle diffusion), where pseudo-second order shows the most dominant for all parameters. Column adsorption studies using EBCT model indicates the removal for NH_3-N was 99 %, while for COD and color were 98 %. The breakthrough capacity and saturated time were found to decreased with increased of flow rate. Experimental data were found more compliant with Thomas and Yoon-Nelson models, compared to Adams-Bohart model. ZELPA can be reused after undertaking regeneration process with 0.5M NaCl solution at pH 11 – 12 (adjusted by 1M NaOH). Its adsorption capacities (in mg/g) for NH_3-N, COD and colour were 32.26, 38.76, 31.95, respectively. Combination of WPS and LS shows a positive impact in leachate adsorption technology. WPS use in adsorption technology indirectly solve the paper waste disposal that can't be recycled.

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